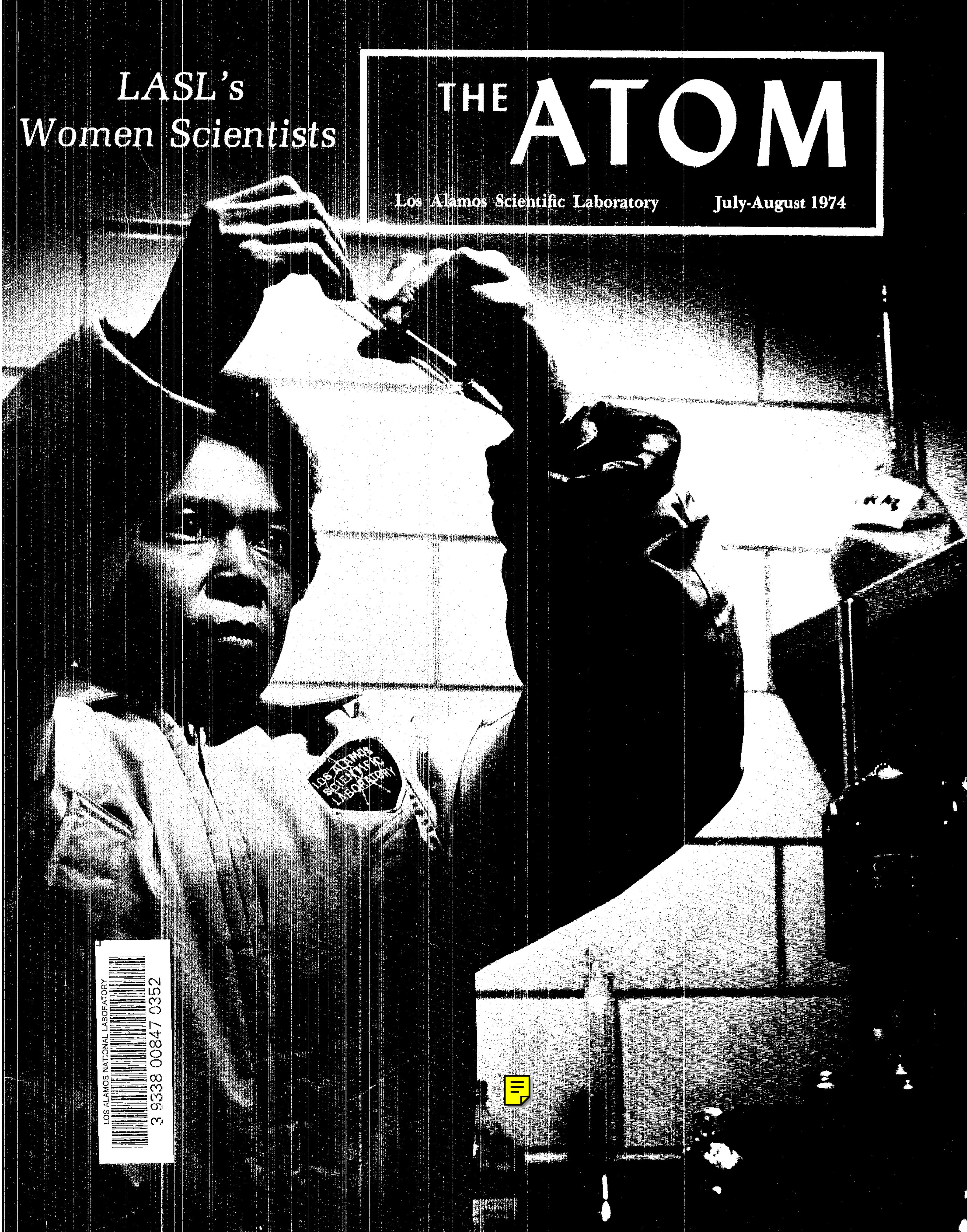
LASL's Women Scientists

THE ATOM

Los Alamos Scientific Laboratory July-August 1974



Volume 11 Number 4
July-August 1974

THE ATOM

Published bimonthly by the University of California, Los Alamos Scientific Laboratory, Office of Public Information, TA-3, West Jemez Road, Los Alamos, New Mexico 87544. Address mail to P.O. Box 1663, Los Alamos, New Mexico 87544. Second Class Postage Paid at Los Alamos, N.M.

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Office: D-442-B Administration Building. Telephone: 667-6102. Printed by the University of New Mexico Printing Plant, Albuquerque.

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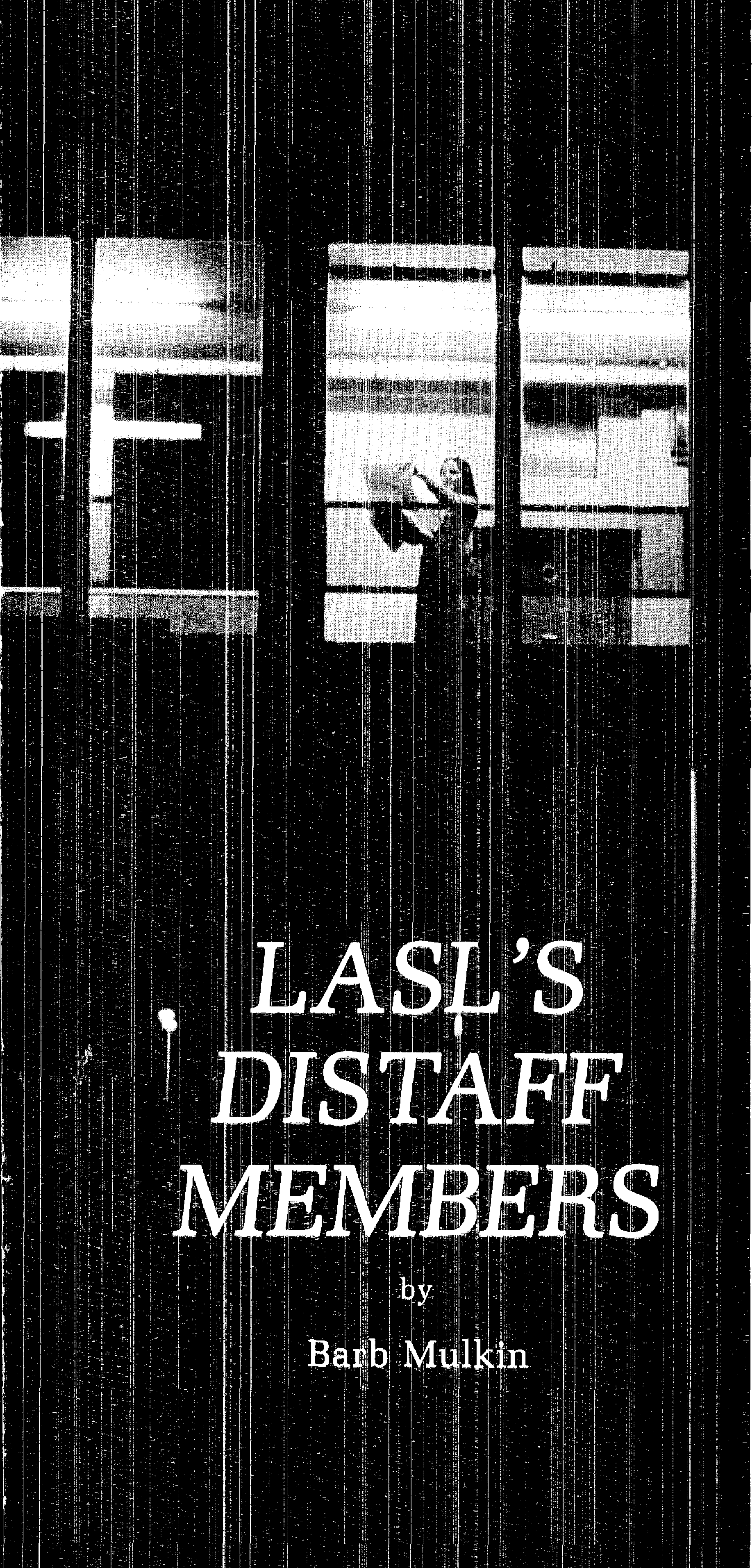
COVER

LASL staff member Julia Hardin, H-9, washes a chromatin preparation during an experiment conducted at LASL's Health Research Laboratory. The intensity she displays is typical of women scientists at the Laboratory, each of whom has managed to combine a demanding career with a full and satisfying personal life.

We give them a crossing to use for their own
With signs warning drivers to leave them alone.
And how do they thank us, as crossing, they skitter?
They emulate mankind and leave us their litter.



LASL'S DISTAFF MEMBERS

by

Barb Mulkin

In the postdawn chill of a Los Alamos morning Beth Plassmann strokes methodically across the Barranca Mesa pool using a disciplined Australian crawl. Anywhere from 32 to 40 laps later she leaves and makes her way to an office in Omega Canyon at the Los Alamos Scientific Laboratory's TA-41 site to take up her duties as leader of Group WX-5. She adheres to this routine 5 mornings a week during the short summer season.

But when she enters TA-41, she becomes a statistic, almost a mythical creature, more generally referred to as a "working woman."

Corporate communicators rarely seem confused about describing the typical male American worker. He is someone who works to support his family, to contribute to society, to gain intellectual stimulation, and perhaps above all, to get ahead.

When it comes to describing a woman who works, the communications gap becomes glaringly apparent. Most American women are believed to work when they have to, to work for pin money, and to attach great importance to friendly coworkers and hours which allow them to arrive home in ample time to fix dinner. Mental stimulation is not often allied with descriptions of American working women.

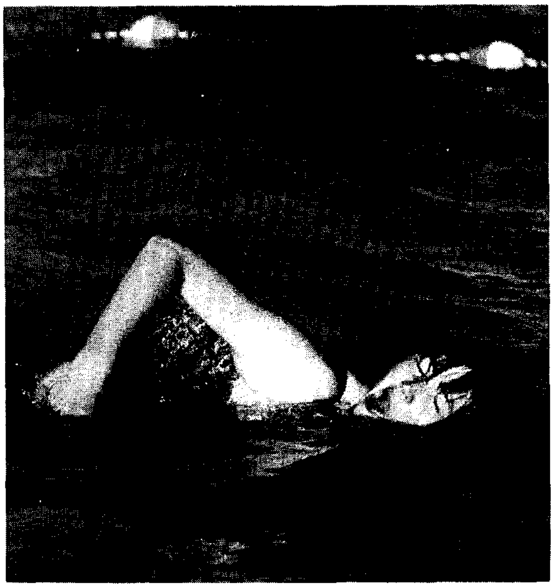
LASL's working women may be the exception to confound the rule and diminish the false stereotype of the statistical creature.

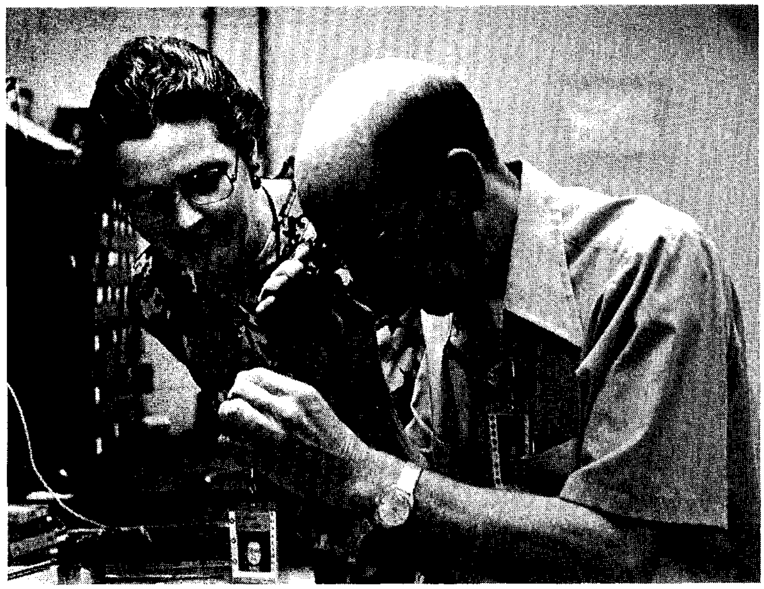
While Beth Plassmann may not be typical of all women who work for the Laboratory, she certainly is not atypical, at least among LASL's 67 distaff staff members.*

It's hard for her to describe what she does at LASL because she could recall only one project (involving x-ray cross-section measurements) on which she had worked since she

**The term "staff member" denotes a member of the scientific staff, i.e., a scientist or engineer.*

Lucy Carruthers, TD-1, scans a computer printout in the lonely silence of a LASL office late at night.





A brisk morning swim invigorates Beth Plassman as she strokes across a Los Alamos pool before taking up her duties as group leader of WX-5. She steals a few moments from the perennial paper work to confer with coworker Walter Ely, WX-5, in a laboratory at TA-41 site in Omega Canyon.

came here in the fall of 1955 which was not classified. An assistant group leader since 1960 and a group leader since 1970, she is rueful about the amount of time she spends on administrative work, which keeps her away from the challenges of weapons components research.

But she is philosophic; it's part of the job of managing a staff of some 30 people including chemists, metallurgists, mathematicians, and fellow physicists. Most of these are men, a fact which she deems unimportant.

"I've never had any problems because I'm a woman in what may be regarded as a man's field," she claims. "When I became an assistant group leader, I heard one man didn't much want to work for a woman. But the group leader reminded him he worked for his wife and apparently that ended the discussion.

"Then, too, after my husband, Gene, and I both came to work for LASL, our first merit raises came up for review. His group leader called mine to make sure that my raise wouldn't be larger than my husband's and cause a problem at home.

"But other than that, I can't recall much significance being attached to my sex."

Beth is the mother of 4 children. One of her fondest memories is of the guys in her group boiling water every morning during the time she was expecting a child. Her alternate group leader, John Mosley, explained it was thoroughly understood that when someone was about to have a baby, hot water would be needed momentarily.

"None of us knew what to do with it," he said, "but we felt we owed it to Beth to be prepared. We drank a lot of instant coffee those mornings."

Beth took 2 weeks off before her first son, Paul, was born, but worked up to the last minute before the birth of her other children: Catherine, Rebecca, and Joseph. She worked half time and three quarters of the time as needed, but has combined a full-time job as a physicist with a family life most of her years since graduation from Bryn Mawr University.

It was at Bryn Mawr that she "became motivated to stay with the sciences—by a beautiful red beard." Walter Michels, the tall, red-bearded former head of the Physics Department, as Beth fondly recalls, was "a firm proponent of women escaping the mold of 'suitable' occupations and entering scientific fields. He had a great influence on my decision to major in physics."

The influence of an outstanding teacher was also credited with propelling another LASL staff member into science.

Darleane Hoffman, a nuclear chemist working in CNC-11, looks back to a woman chemistry professor, Dr. Nellie Naylor, who taught general chemistry at Iowa State University, as the woman who turner her interest from applied art to chemistry.

"She was inspiring and, of course, I was lucky. I had parents who felt I could go as far as my talents and enthusiasm would take me, regardless of whether the particular career was one commonly chosen by a woman," Darleane explained. "My brother wound up in chemistry, too, but he is younger than I and I was already embarked on my career before he chose his."

Discrimination because of sex does exist, all 4 staff members interviewed agreed. The discrimination each felt she had encountered in her professional life varied, however, from a good deal to almost none. All believed that society and the mores of American culture are basically to blame for any discrimination in hiring women.

"You sensed it in job interviews when business recruiters came to the campus," Beth recalled. "I was earning my Ph.D. in physics and I received one job offer as a librarian."

"There is often some initial shock when I am introduced and Dr. D. C. Hoffman turns out to be a woman," Darleane says. "But so often, I think it is not so much discrimination as the bald fact that too many girls are trained from grade school in the belief that there are certain suitable occupations for women and that they should aspire no further.

"I think it is important for girls to develop appropriate images so that they don't think of women scientists as freaks. You can follow a scientific career and still have a home and family."

Darleane feels a certain obligation is attached to becoming successful in a chosen field if you are a woman.

"At least initially, I think you have to prove yourself. You have to work harder and longer. You have to try to dispel the old stereotype that says women can't be depended upon and that they don't stay in a job long enough to make hiring them worthwhile.

"You don't want to jeopardize the chances of other women by your actions, so you try harder. Too many women have been short-changed in developing their potential, though I do believe there are ways through the loopholes if you are intensely motivated."

The Hoffman offspring are Maureane, 17, a National Merit Scholarship winner and a student at New Mexico State University, and Daryl, 14.

"Maureane is leaning toward medicine, probably veterinary medicine," her mother said. "Daryl hasn't decided, but right now he thinks he wants to be a race car driver!"

Darleane has worked steadily since the 1950's, surviving the rationale in vogue during that decade which levelled criticism at working moms who were blamed for everything that was supposed to be wrong with American youth. She feels quite the opposite is true—that her limited time at home has forged a cohesive family group and fostered maturity and independence in her children.

As for her husband, she feels it takes a "very secure and understanding man for this kind of marriage to work. For me, there has been no conflict of interests, though we work in similar fields. In fact, we sometimes work together. Recently Marvin and I wrote a review article together on 'Post-Fission Phenomena.'"

Pausing, she laughed, "I guess I'm grateful I still have a marriage. When Marvin and I were married he still had a year to go for his doctorate. I had just received my Ph.D. in chemistry and a few weeks later I left for Oak Ridge to take a job as a chemist. His major professor in physics at Iowa State said this marriage would never last."

Work, at least for a woman, can create problems in marriage.

Lucy Carruthers, TD-1, a chemist-programmer who works in weapons physics design by means of computers, remarried 5 years ago after a divorce which "was at least partly caused by the fact that I wanted a career."

Now married to Peter Carruthers, division leader of T-Division, Lucy has 3 children by her first marriage: Katheryn, Susanna, and Glendon; and 3 stepchildren: Debra, Kathryn and Peter.

"We run the Carruthers' Hilton," she remarks, "where a classic soap opera unfolds day by day!"

Possessed of a puckish sense of humor, she claims she was formerly a "fringe benefit wife." She agrees that there is a vast potential of talent in many women which has never been fully developed and blames "the establishment" in large part for the failure to use this talent.

"I think it is important for girls to develop appropriate images so that they don't think of women scientists as freaks. You can follow a scientific career and still have a home and a family."

"I was impressed when we came to LASL," she explained. "There is a prevailing attitude that it is run as a military base. But, coming as we did from the academic life, I found that the Laboratory was more liberal and more democratic for employees than most universities."

"For instance, Cornell, where my husband taught, had no women on its faculty in physics or chemistry at that time. There are few academic jobs open to women in the sciences, but at LASL, a science degree qualifies one for a staff member job, and it is more democratic."

A graduate of Rutgers University, she was the first person to claim a degree in theoretical chemistry from that school.

"Computers were a new and little known science then—Rutgers had only one computer—and they didn't offer a degree in theoretical chemistry. If you were a chemist you were expected to be a laboratory chemist."

Lucy was pregnant. This, combined with being given no choice but to undertake a laboratory thesis project in a field other than the one she wanted, led her to announce her resignation from the graduate school.

The administration reconsidered, however. "In a week or two, they instituted a theoretical chemistry program, and I went on to earn my degree," Lucy says. She felt that despite being pregnant, the opportunity to pursue her chosen field of study made the effort worthwhile.

On the other hand, women enjoy a few compensating advantages. "Women are luckier than men in some respects," she says. "They sometimes enjoy extra freedom and aren't totally responsible for raising a family."

Knowledgeable about women's lib because she is interested in the subject, Lucy empathizes with the basic aims of the lib movement, but confesses to a dislike of its more strident overtones.

"There are inequities in the system, let's face it. In computing, a

Darleane Hoffman, CNC-11, participated in the discovery of natural plutonium-244 in bastanite ore. For diversion, she and her husband, Marvin, relax around the family piano with their son Daryl and daughter Maureane joining in.

scientific field where there are more women than in most others, there is often a certain ambiguity about how a person is classified. There seems to be a bias, even on the part of other women, to automatically conclude a woman is under the direction of a man, regardless of what her background is. That's sad."

Sometimes, Lucy concludes, women don't get what they should because they don't ask for it.

"Aren't little girls trained to be nice and not to throw tantrums? If they stick with that they often suffer accordingly."

"I suppose that's true," mused Julia Hardin, H-9, a staff member working in biomedical science.

"I blame many parents. I'm single and so maybe I shouldn't be making judgments, but I've seen so many families where the girls were automatically not considered for college, or else they were sent only so that they would be sure of exposure to catch a husband!"

Articulate and down-to-earth, Julia has a B.S. degree in biology and an M.S. degree in zoology. She says if she had discovered the heady world of show dogs before she had completed her education, "I'd probably have opted for becoming a professional dog groomer."

Blowing on her chilly fingers to warm them after leaving the 3 degree atmosphere of the cold room where she was preparing Chinese hamster ovary cells for an experiment, Julia waxed enthusiastic about her hobby of raising Welsh and wire-haired fox terriers for show.

"It doesn't leave you much time for any other interests," she said. "Most weekends I am off to a show in the region, and I've given up golf completely since I became so involved in raising dogs."

A reflection of her passion for golf remains, however, in the name of her first Welsh terrier, "Divot." The pride of her life now is a Pajarito Acres-raised Welsh male named "Bouncer," who ranks among the top 10 dogs of the breed in the nation.

The Carruthers are avid backpackers, once were almost trapped by snow at Bandelier on New Year's Eve, 1973. Here Lucy's husband, Peter, adjusts things for Lucy for a hike under gentler conditions.

Though Julia kids about becoming a professional dog groomer, she does harbor an ambition to become a show dog conformation judge.

"I've judged in fun matches and sanction matches where the rules are the same as for championship shows, but with no points awarded. It would really be great, though, to become a qualified conformation judge of terriers."

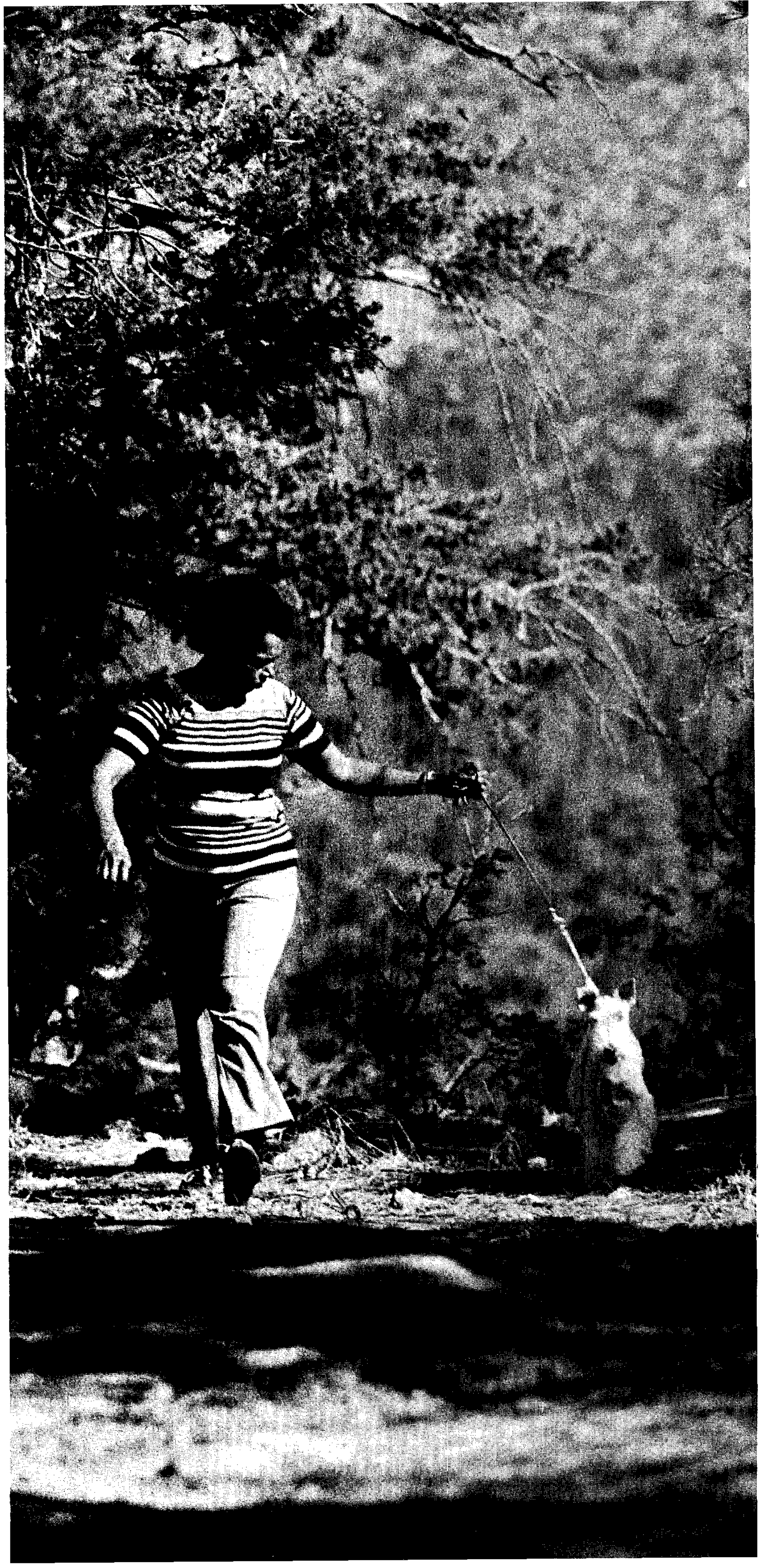
This may come to pass, but now most of her waking hours are spent in a health research laboratory at TA-43 near the hospital. There she and biologist Paul Todd, a visiting staff member from Pennsylvania State, are conducting biological research.

They share an experiment, and they obviously share a professional rapport and a feeling of fun which sparkles in their conversation.

Unaccustomed to describing their scientific work in lay terms, Paul became increasingly amused as he referred to portions of a cell diagram as "chains of red beads descending from green globs."

Julia roared in laughter at the outlandish imagery. Then, becoming serious again, she interrupted Paul to explain that the green globs represent ribosomes, or cell clusters where protein is manufactured, and the red beads symbolize elongated protein molecules. Both of these are involved in their research, which

Across a sun-dappled forest floor near Los Alamos, Julia Hardin romps with "Pinto," a wire-haired fox terrier for whom Julia holds high hopes in show competition.



has to do with determining mutations, or genetic changes, that occur in DNA when it is exposed to radiation.

"We use Chinese hamster cells because they have only 22 chromosomes instead of 46 in man and 40 in mice. There's less to mess with," Julia explains.

Paul prepares the specimens by feeding the cells a "balanced diet" containing sugar, vitamins, minerals, and amino acids (the building blocks of protein). After the cells are incubated, they divide twice a day. They are irradiated with ultraviolet rays and then chilled to -80°C to halt the dividing process.

Julia works with them in a cold room which requires that she bundle in heavy clothing. She can stand it for about 15 minutes at a time, then has to come out and warm her fingers.

"We literally homogenize the cells, running them through a blender, then through a centrifuge which separates the DNA genetic molecule and its protein from the other cell components," she explains."

She shrugs into a heavy jacket, getting ready to return to her cold room.

"Getting back to the other subject," she says quietly, "a few years back I was a research assistant here, and a lot of other women were, too. I raised the question of whether my qualifications were appropriate for a staff member position. I thought they were. I was made a staff member, and many of the other women were, too. I don't claim I effected any change, but then, I think if you are constructive in your attitudes, instead of destructive, change will come.

"I believe that."

As the citizens of ancient Rome must have thought of their remote garrisons on the Rhine, as the War Department must have thought of its cavalry outposts on the Western frontier, so must many Los Alamos Scientific Laboratory personnel think of LASL's small but vital detachment somewhere out there on the desert at the Nevada Test Site, which is rarely if at all.

Only a relative handful of LASL employees in Los Alamos ever visit the NTS: primarily those of J-Division, responsible for field testing at NTS, and those in various groups involved in weapons development and nuclear research. To other LASL employees, the NTS is, understandably, something of a mystery.

And the NTS is even more mysterious to most wives and dependents. Because it is 65 miles northwest of Las Vegas and is a secured area where much of the work is classified, wives and dependents, when they accompany their LASL-employeed husbands on travel to Las Vegas, rarely visit the NTS. Even some families of LASL personnel stationed at the NTS have only a vague idea of "where Daddy works."

To remedy this, "spouses and dependents tours" were inaugurated last year. Open to all LASL personnel and their families, these guided tours were so enthusiastically received that J-Division repeated them this year on June 17 and June 24. *The Atom* joined the latter tour and learned that LASL employees at the NTS do some of the most interesting work on (and under) the earth.

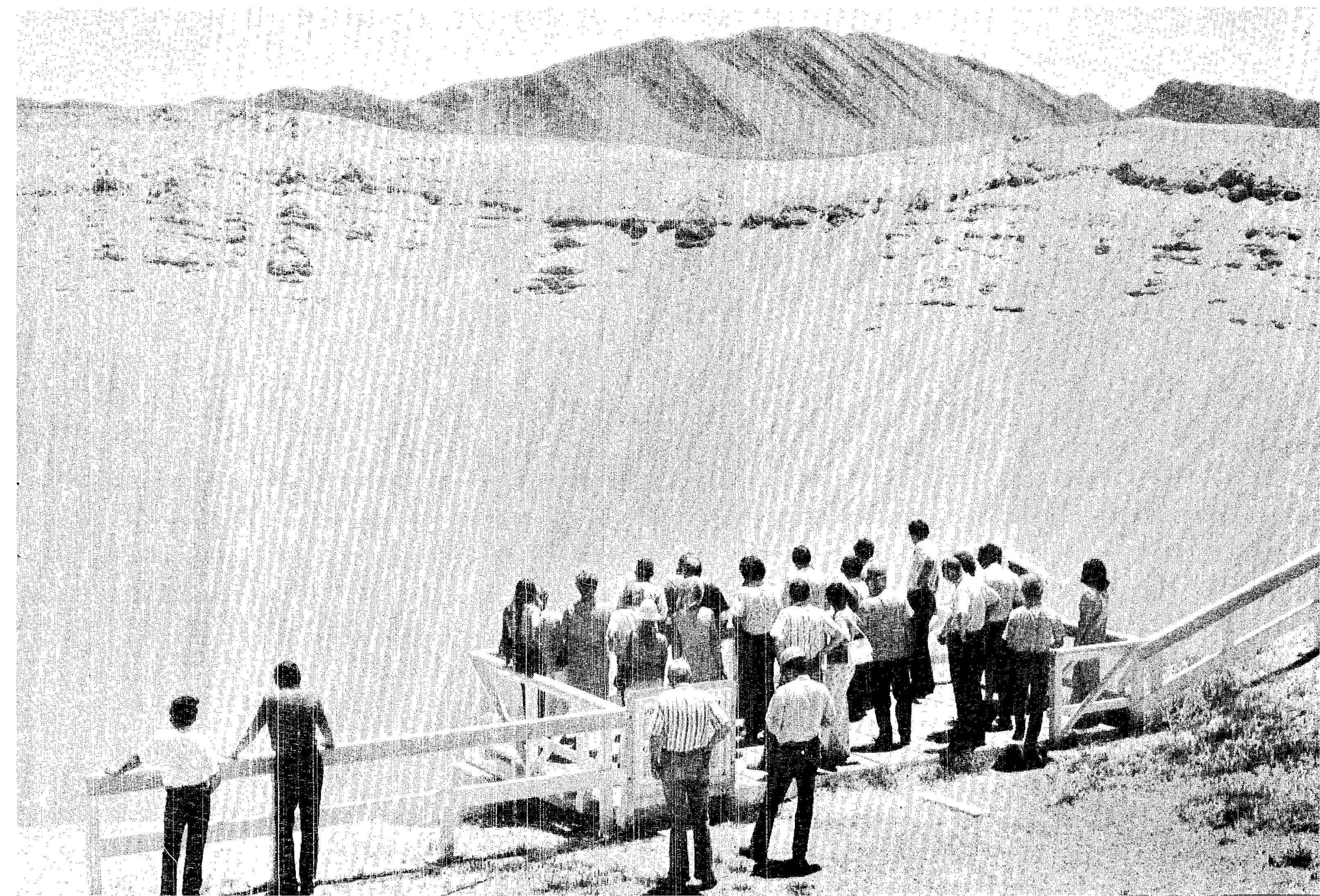
Getting Acquainted

Bob Beiler, J-3 group leader, ably assisted by Chet Steele, J-3, (jokingly referred to as a "coffee, tea, or milk attendant" while serving

WHERE DADDY WORKS

a memorable visit to the NTS

A high point of the NTS tour was a visit to awesome Sedan crater, a product of a Plowshare experiment in 1962.



Top: Chet Steele doubles as "flight attendant." Middle: Jack Busick explains Control Room 1. Right: Gina Robertson wisely uses parasol in desert heat. Bottom: Jerry Beatty explains assembly tower.

snacks on the bus), ran things like clockwork. That the clockwork slowed as the tour progressed was due only to the intense interest they generated among the guests resulting in an "overkill" of questions.

After early-morning pickups of guests at 2 motels and at the Atomic Energy Commission's impressive Operations Office in Las Vegas, the tour proceeded via air-conditioned bus northeast on U.S. 95 towards Mercury—the main domicile, logistic base, and operations headquarters for the NTS. The time for the trip—1 hour and 20 minutes—passed more rapidly than the group realized, thanks to indoctrination briefings by Beiler and Steele.

For instance, the group learned that while the NTS may be an outpost as far as many in the Laboratory are concerned, it is a major operations area to the AEC. Larger than the state of Rhode Island and employing from 3,500 to 3,700, it has been the site of some 400 announced nuclear experiments since 1951 when the NTS was established.

Thundering Caterpillars

Also accompanying the group was geological engineer Bob Sharp, J-6, who directed the group's attention to the passing scenery, which is characterized by flat desert floors and stark mountains. Among geologists, the region is known as the Basin and Range Province.

Appearances were deceiving. Sharp explained that beneath the dry and sterile surface are substantial water reserves. The area was once an ocean floor with a characteristic buildup of marine limestone deposits over the eons. Earth movement and volcanic activity raised the floor and folded underlying rock into mountain ranges rising thousands of feet above the basin. Gravelly alluvium, washed down from the surrounding mountains, was deposited over the limestone and volcanic rocks except for a few areas, conspicuously visible today, that were once the bottom of lakes.

As the Ice Age subsided, glaciers to the north melted. Vast quantities of water drained into the province and permeated the alluvium, but were generally trapped underground by the relatively impermeable rocks where they remain largely intact at shallow depths to this day. A notable exception: Yucca Flat at the NTS where the underlying limestone is broken and water drains to lower elevations well below most downhole testing.

A geologist of the late 1800's, with prescience and wit, wrote that "if one could view this region from the air, it would appear as a herd of caterpillars thundering southward across a plain towards Mexico."

The geology of the region serves science well. The alluvial soil is comparatively easy to drill and its compaction characteristics somewhat reduce seismic shock. Most detonations occur above the locally deep water table, thus minimizing the possibility of contaminating underground water. In any event, the rate of underground water flow is so slow that it would take many decades or centuries for water to seep beyond the NTS. By that time, if any radioactivity were present, it would have decayed to levels well below acceptable standards for drinking water and perhaps would not even be detectable.

NTS Nerve Center

After clearing the AEC guard station at the entrance to the NTS, the group proceeded to J-3's small but attractive office at Mercury where it met, among others, Donna Carr, who had handled so smoothly the many details entailed with the tours. After brief inspections of other J-Division facilities, the group reboarded the bus to visit CP-1, a central control station on a crest with vistas toward both Yucca and Frenchman Flats (dry lake beds) where so many tests have been conducted.

George Hoover, AEC operations officer, acted as master of ceremonies in the theater-like Test Operation Room which was replete with closed circuit TV and phones that form the nerve center of a communications network when countdowns are in progress. In that room, 20 or more experts monitor all aspects of underground testing, including all-important meteorological reports that determine "go" or "no go" for any given test. Hoover narrated a film of various tests, taken from the air, clearly showing the quick-as-a-wink shock wave that flashes out in an expanding ring from surface ground zero above detonation. This is followed, at times ranging from minutes to hours, by the formation of the subsidence crater as a chimney of rubble in the downhole collapses following the diminuation of pressure at the detonation point far below.

The group was then conducted to Control Room 1 where Jack Busick, J-8, explained the room's elaborate computer-linked equipment for monitoring countdowns, firing the device, and acquiring test data. Among the guests who asked Busick the knottiest questions were his wife, Ruth, and daughter, Diane.

A Cruise on the Desert

Like an air-conditioned boat cruising across a sea of sand, the bus left CP-1 and began a voyage toward the deeper reaches of the NTS. On either side of the road, a moonlike landscape of subsidence craters could be seen. The group paused briefly to leave the bus and inspect a crater close at hand. Its diameter of over a hundred meters was mute testimony to the energy that had once been released far beneath the earth.

The group passed a drill rig, capable of drilling extremely wide-diameter holes (the biggest ever drilled), on the way to visit a mobile assemby tower. (A third type tower, a mobile monitoring tower, has been used on more elaborate tests. It collects data over ground zero at the moment of explosion, then moves by rail to beyond the limits of the anticipated subsidence crater so that it is saved for future tests.)

The assembly tower, some 40 meters (130 feet) high, is used to assemble racks consisting of the device and instrumentation that is later lowered downhole. For elaborate tests, this is an intricate operation calling for, among other things, precise balancing so that the rack will not bind against the downhole casing while being lowered.

And guests learned from Jerry Beatty, J-7, of a number of unusual problems with which engineers have had to cope. For instance, special cables leading down the hole were devised to withstand tremendous pressures and temperatures and thus prevent the escape of effluent to the surface.

Beiler and his associates had saved one of the largest craters for a fitting climax to the morning. This was an awesome gouge out of the desert nearly 390 meters (nearly 1/4 mile) in diameter by 100 meters (320 feet) deep with a rim of debris perhaps 7 meters (22 feet) high piled up above the desert floor. Called Sedan Crater, it was formed in 1962 as part of the Plowshare cratering experiments to develop the peaceful use of nuclear explosives for large-scale earth-moving operations.

A Cruise under the Desert

Following lunch at the cafeteria at Area 12's base camp—an air-conditioned oasis—the bus proceeded on a short 10-minute drive to the site of what would be the major event on the afternoon agenda: a trip deep underground to see how another kind of nuclear testing is accomplished.

The bus parked at the base of a mesa whose most conspicious feature was a tunnel entrance cut into its side. Following a briefing in a nearby mobile office by U.S. Air Force Captain Bradford A. Smith of the Defense Nuclear Agency, the group boarded a Toonerville Trolley-type train at the tunnel entrance. As the diesel engine roared and the tiny passenger cars clanked, the train left the outer world of brilliant light and blazing heat to enter one of cool darkness. The visitors were about to view a remarkably ingenious system for conducting underground experiments.

As the group had learned from

Captain Smith, this system is roughly analogous to a wheel lying on its side with its axle extending vertically to the surface. The axle is a permanent shaft containing myriad cables that carry test data from experiments to a building on top of the mesa.

The train journeyed more than ½ mile through the tunnel taking the visitors to a complex of drifts, or secondary tunnels, jutting out from the hub like spokes. In these drifts experiments are conducted primarily to measure the effects of radiation and heat from a nuclear detonation upon weapons components and materials rather than to test the nuclear devices themselves.

To minimize the force of a nuclear explosion sufficiently to confine damage to but a small portion of the system and, at the same time, to provide an environment simulating that of space, scientists and engineers in effect designed a giant vacuum bottle. In a vacuum, a nuclear detonation releases intense heat and radiation, but the devastating shock wave generated in an atmosphere is absent.

The vacuum bottle the group saw was gigantic: over 600 meters (1,900 feet) long and tapering from a diameter of about 1/3 meter (1 foot) at "ground zero," or the detonation end, to over 8 meters (over 25 feet) at the terminal end.

The tube at ground zero is surrounded by rock, dirt, and concrete to contain, to a degree, the force of the explosion. Inside the pipe is a series of gas-driven mechanical doors capable of closing in times measured in thousandths of a second. Following detonation, bursts of radiation and neutrons travel rapidly down the tube. The doors snap shut after these bursts have passed to contain the slower moving vaporized debris from the device and chamber walls that has begun to form.

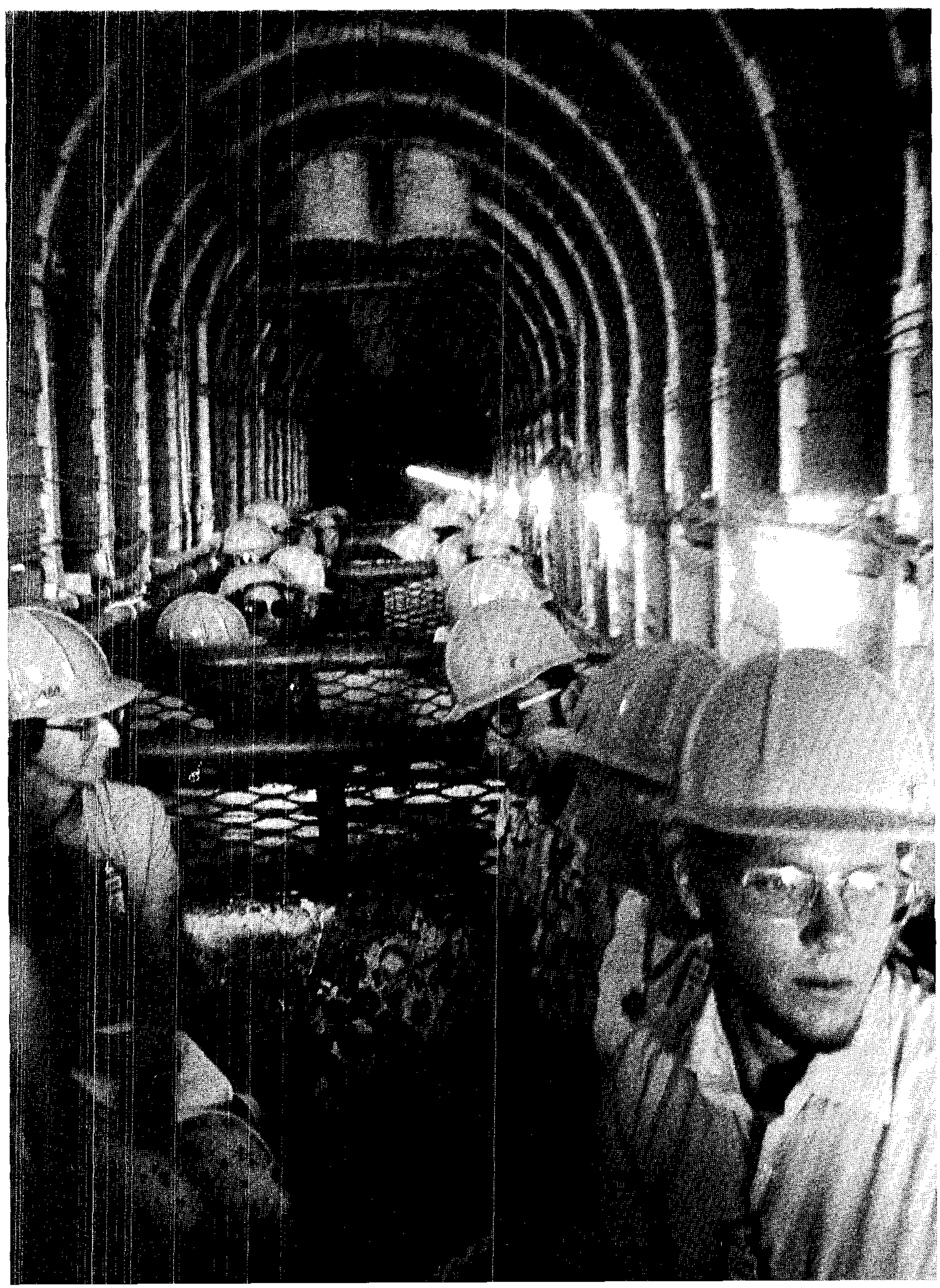
The bursts reach various samples and instrumentation for measuring effects and then pass these by to dissipate over the length of the tube.

That's the principle, and it works. But nobody takes chances. Like corks in a bottle, several overburden plugs of concrete are placed along the tunnel. A gas seal door near the junction with the main tunnel forms a final barrier to any radioactive matter escaping to the atmosphere.

Although resembling some huge boiler, the chamber is as carefully built as the most delicate laboratory instrument on earth. Vacuums to 1 micron, equivalent to that in space 300,000 feet above the earth, are regularly created—a feat that not even many laboratory vacuum chambers can equal.

Returning to the world of desert and mountain, the tour proceeded to Pahute Mesa, a site which, because of its remoteness and greater elevation has been used for tests of high-yield devices in very deep holes, then to Frenchman Flat to see remnants of buildings erected for atmospheric tests conducted in the 1950's. The bus also passed Survival City, constructed in the same era for a Civil Defense test

Train takes visitors deep into a mountain . . .



of the effects of an atmospheric explosion upon a typical town. Little remains except memories, such as of pranksters creating a flap of sorts prior to the test by arranging manikins in comic and even compromising positions.

The tour concluded with a quick trip through Mercury, including a walkthrough of LASL's neat but monastic dormitory there, and a relaxed ride back to the neon-lit Strip of Las Vegas.

Footnote to History?

As *The Atom* went to press, two reports, by coincidence, focused world attention on the role and importance of the Nevada Test Site.

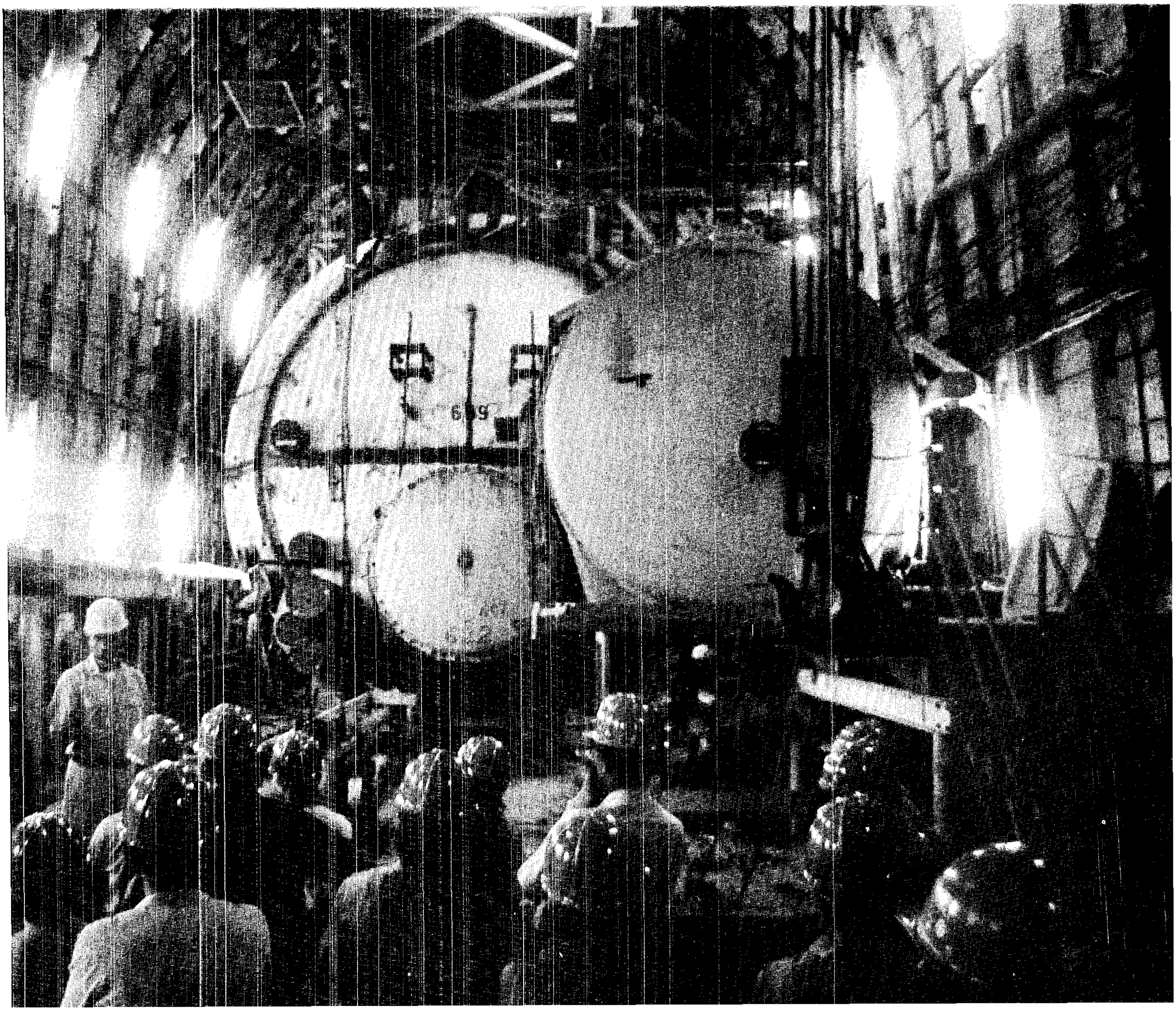
In England, some members of Parliament reacted critically upon hearing that a United Kingdom device had been tested recently at the NTS.

And at a summit meeting in the Soviet Union, discussions were held between President Richard Nixon and Soviet Party Chief Leonid Brezhnev on limiting and perhaps eventually banning future underground nuclear tests.

Regardless of the outcome of these summit talks, the Nevada Test Site will go down in history as one of the world's unique places where scientific theory was verified by tests on a gigantic scale in the interest of national security and the advancement of pure research itself.

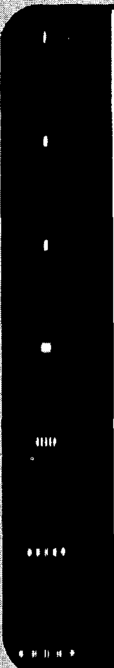
To the handful of LASL personnl who have been stationed there and to the many LASL personnel from Los Alamos who have visited there to help conduct experiments over the years, the NTS will always hold very special memories of its own.

. . . to view gigantic tube that has frequently been employed in underground nuclear tests.



If your group has achieved a scientific advance, acquired new equipment, or developed a new technique, we'd like to know about it. Phone The Atom at 6101 for possible inclusion in future Science Spectrum sections.

SCIENCE SPECTRUM

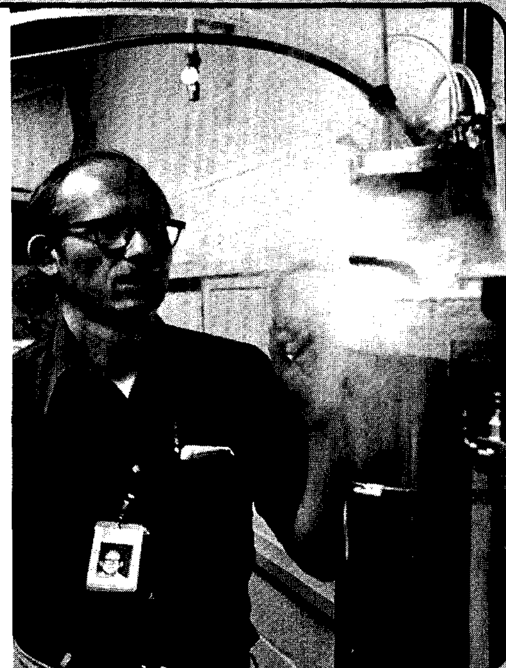


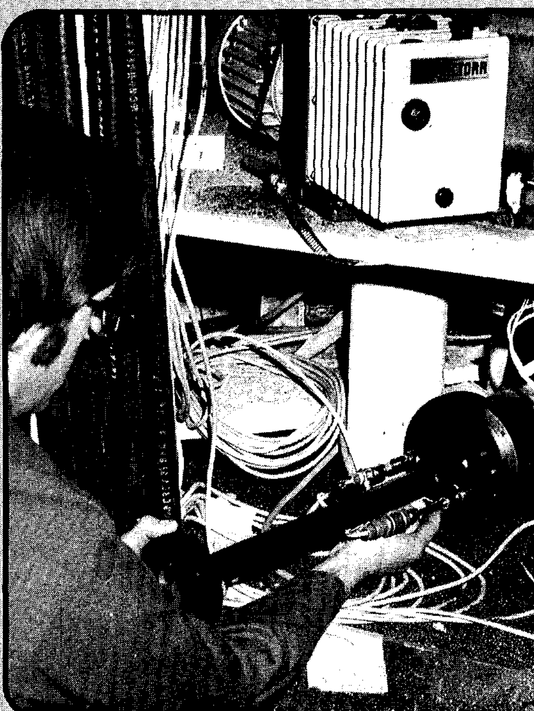
New Spectral Lineup

In 1896, Dutch physicist P. Zeeman showed that certain single spectral lines (top left) can be further split into component lines (middle and bottom left) when emitting atoms are placed in a magnetic field. The more intense the field, the more the lines are separated. These lines yield data useful to those researching isotope separation and equations of state, among other things.

Until late May, CMB-1 was working with data from a conventional magnet generating 30,000 gauss located at Argonne National Laboratory. But now, a new superconducting magnet, cooled by liquid nitrogen and helium, has been integrated into the spectroscopic system at LASL yielding resolution shown in the bottom lines. According to Lee Radziemski and Rolf Engleman, CMB-1, it generates twice the field strength and the equipment costs 1/10 as much compared to conventional electromagnets.

At right Radziemski checks the admission of liquid nitrogen to the dewar.





Underground Laser

Digging deep for basic information is nothing new to LASL scientists. But digging deep, literally, to test a laser theory is.

The theory: an intense burst of gamma radiation would produce a very brief, very powerful laser pulse.

The test: place a sulfur hexafluoride and ethane cavity on a rack for an underground test at the Nevada Test Site (see page 7) and expose it to gamma radiation from a nuclear explosion.

The results: gamma rays at energy levels far exceeding those from any laboratory source initiated a laser pulse of 16-17 nanoseconds (billionths of a second) compared to 50-100 ns normally realized in electron beam-initiated lasers. As predicted, total energy output was moderate, but energy output per unit volume exceeded most laboratory outputs.

As Steve Clarke, TD-1, Daniel Metzger, J-14, and Peter Lyons, J-14, (shown at left placing the cavity in the rack) explain, electric discharge and electron beams are customarily used to pump HF lasers. In this experiment, the first of its kind in the vicinity of a nuclear detonation, electrons were still the pumping agent, but had received energy in massive amounts from the gamma rays.

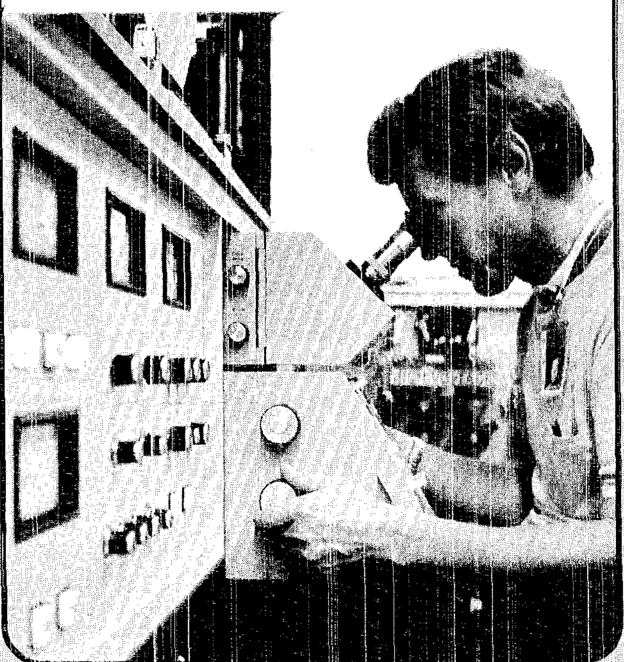
Probing the Surface

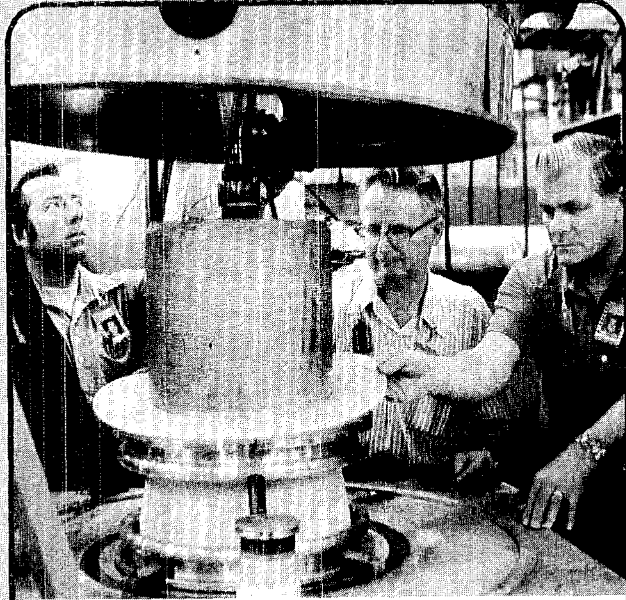
A sophisticated ion microprobe that focuses a beam of ions to a point considerably smaller than that of a pin will help CMB-Division obtain data they could not obtain before in studying the content and structure of matter. Unlike other microprobes, it can identify even faint traces of elements present at the surface and map their distribution visually or statistically.

Ions of oxygen, nitrogen, or argon are generated in a duoplasmatron and focused magnetically on a sample target that is typically a centimeter or so in dimensions. The ion beam may scan all or a portion of the target, remain at a point of interest, or move back and forth to "peel" layers of atoms from the surface.

The ion beam interacting with the surface generates ions of the sample material which are withdrawn magnetically and directed into a mass spectrometer. The spectrum or any part of it can then be translated into an oscilloscope display, recorded as a spectrogram, or fed into a minicomputer.

According to Arnold Hakkila, CMB-1, shown below focusing the ion beam on a target sample, the versatile instrument will have many applications such as the surface analysis of rock samples from geothermal drilling and of materials for weapons components, fast breeder reactors, and heart pacemakers.





For Clearer Insights

PHERMEX, LASL's facility for taking flash radiographs (x-ray photos) in less than one-millionth of a second of objects during an explosion, is a valuable research tool. So valuable, in fact, for weapons research and understanding the fluid behavior of metals under extremely high pressures, that the Laboratory decided PHERMEX needed greater penetration power. This enhancement is expected to improve the radiographic resolution for thick sections by a factor of perhaps 5.

To accomplish this, Group M-2 is, in effect, installing a bigger "engine" in the present "chassis."

The present "engine" consists of nine 1-megawatt amplifying tubes for accelerating an electron beam which, upon hitting a tungsten target, generates the x-ray pulse that makes the radiograph.

The first components of the new "engine" will be added this summer: two 3-megawatt amplifying tubes. One of them is shown here being installed by Bob Chiles, Jack Hardwick, and Bill Basmann, all M-2, for testing in M-Division's prototype accelerator prior to installation in PHERMEX. Additional more powerful tubes will be installed at later dates.

Whirlwind visits by high officials have almost become a Los Alamos Scientific Laboratory specialty. Latest was that of Vice President Gerald R. Ford, who visited LASL on the morning of Friday, July 12.

Ford came to New Mexico to address the National Lieutenant Governors' Conference in Santa Fe on Friday afternoon, but managed to squeeze in a visit to LASL that morning. Accompanying him on a two-engine charter plane from Albuquerque were U.S. Representatives Manuel Lujan, Jr., and Harold Runnels (both N.M.), AEC Commissioner William Kriegsman, and H. C. Donnelly, manager of the AEC's Albuquerque Operations Office.

Greeting Ford and his party at the Los Alamos Airport were AEC Chairman Dixy Lee Ray and her technical assistant, David Jenkins (both had arrived the night before), and Laboratory Director Harold Agnew. A few brief welcoming formalities, a word or two to the press, and the Vice President and his party were whisked away to a busy morning indeed.

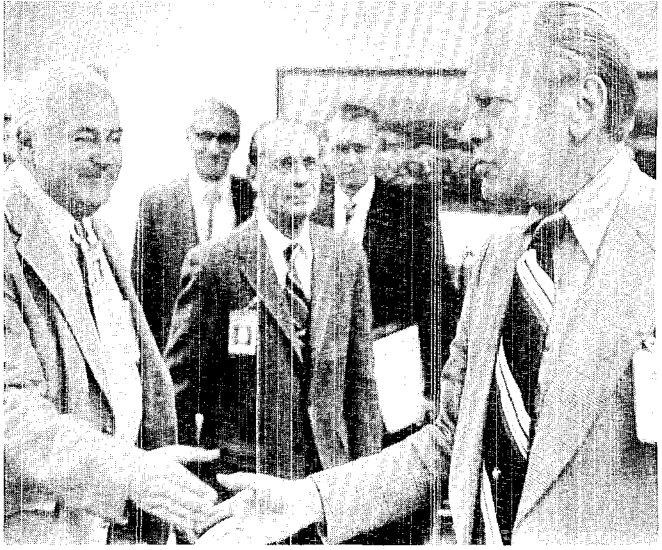
A Distinguished Guest from Washington

Vice President Ford Visits LASL

The press scrambles for positions, some moving ladders to get a view from the top.

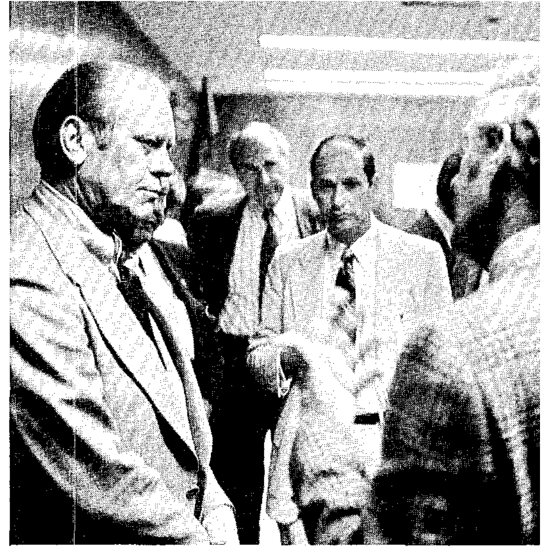
The Vice President arrives, waves to admirers. Lujan and Runnels are to the right.

Ford pauses for a few brief words to the press, accompanied by Agnew (left), Ray, and Runnels (right).



Keith Boyer, L-Division leader, meets Ford. Watching are Richard Taschek, ADR; Richard Baker, CMB division leader; and Morton C. Smith, Q-22 group leader.

Agnew explains fine points of display to Ford in the Green Room.



More explanations in the Blue Room as Donnelly and Kriegsman listen.

A moment of relaxation and it's off to Scyllac. Left to right: Agnew, Ford, Ray, and Jenkins.

Ford, Ray, and Runnels learn "all" about Scyllac from George Sawyer, CTR alternate division leader, and Warren Quinn, CTR-3 group leader.

Looking into things more closely are Lujan (front) and Ford.

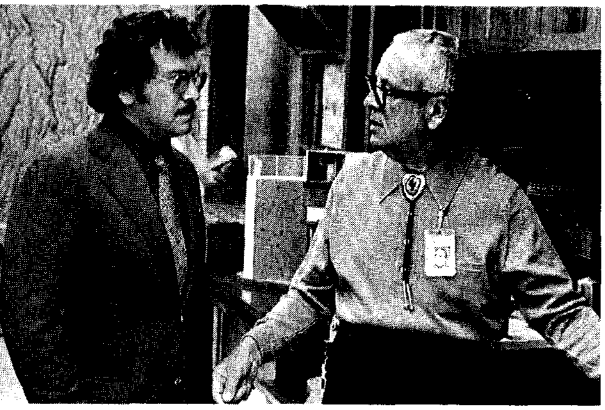
Highlight of Scyllac briefing: Ford receives a sample of trinitite, fused soil and rock from historic Trinity site.

Another whirlwind visit ends all too soon. The Vice President departs for the National Lieutenant Governors' Conference in Santa Fe just before noon.

Other Distinguished Guests . . .

. . . from home

To attend the 2nd Annual Life Sciences Symposium titled "Plutonium Health Implications for Man," AEC Commissioner Clarence Larson visited LASL May 21. Here Larson (second from right) is briefed by Frank Durham (left) and Paul Robinson (right), both L-Division assistant leaders, as his special assistant, John Griffin listens.



To discuss plans for the Lieutenant Governors' Conference held in Albuquerque and Santa Fe in July, Lt. Gov. Roberto Mondragon came to LASL in May to arrange for the visiting officials to tour LAMPF on July 12. Mondragon took time out for a tour of the museum escorted by Robert Porton, ISD-2 group leader (right).

To speak at a colloquium, July 2, Arthur L. Shawlow, chairman of the physics department at Stanford University, came to LASL. Shawlow spoke on the present and future of lasers, amply illustrating his talk with humorous anecdotes and demonstrations with props such as this "ray gun."

To speak at a special colloquium, May 24, U.S. Representative Manuel Lujan Jr., came to Los Alamos. During his visit, he inspected a pickup truck with a standard V-8 motor which has been converted to run on liquid hydrogen. Shown with Lujan are Director Harold Agnew and Walter Stewart, Q-26.

To visit the Clinton P. Anderson Los Alamos Meson Physics Facility, participants in the National Lieutenant Governors' Conference in Albuquerque came to Los Alamos, enjoyed a picnic lunch served after the LAMPF tour.

To visit LAMPF, a team of Russian specialists *in the treatment of cancer* with heavy ions visited LASL in June. Touring the facility with Ed Knapp (MP-Division (center), are (left to right), Viktor Yakovlevich Shikhov, Yelizaveta Il-Inichna Minakova, and Igor Aleksanrovich Prudnikov, leader of the group. Not pictured is Sergey Igorovich Blokhin.

To visit Charles Fenstermacher, L-1 *group leader,* Peter A. *Atanasov* of the Bulgarian Academy of Sciences, Institute of Electronics came to LASL June 6. During his stay he toured the Bradbury Science Hall and Museum with Sam Brock, ISD-2 (left).

To discuss the program of the Alexander *von-Humboldt Foundation* of Bonn, Germany, Hellmut Hanle of the Foundation and his secretary, Frau Elsa Bartle, visited LASL June 26. The visitors toured the museum escorted by Bob Brashear, ISD-2 (left), John Ward, CMB-5 (center), and Mike Montgomery, P-4 (rear).

. . . and abroad

To tour LASL's laser division, June 24, as part of a National Academy of Sciences-sponsored visit, a delegation from the People's Republic of China was on hand. Left to right, Lin Tsun-chi, Wang Ta-heng, head of the group, Li Ming-te (interpreter), P. K. Kuo (U.S. interpreter), and Lu Ming listen to Joe Perry, L-2.

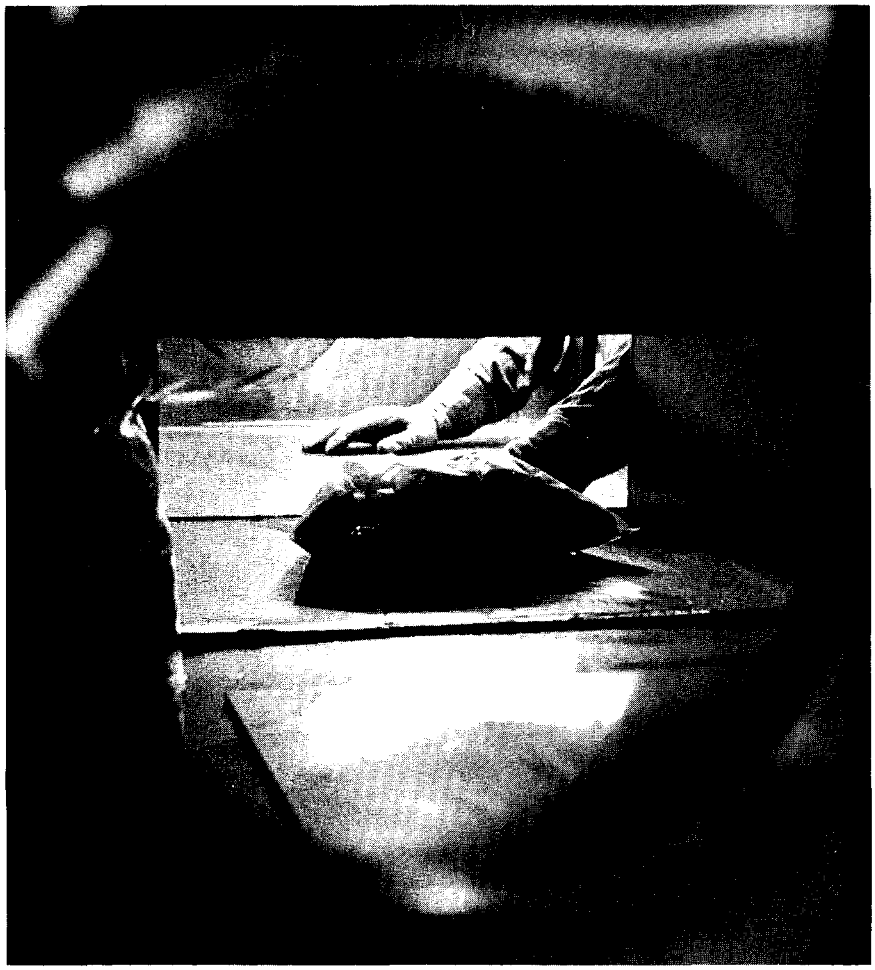
To speak at LASL in May, John Challens, deputy director of the United Kingdom's Atomic Weapons Research Establishment, visited Los Alamos. Here Challens (center rear) addresses the United States-United Kingdom Stocktake Committee, as Director Harold Agnew (left) listens.

To tour LAMPF, a large contingent of international scientists arrived in Los Alamos in July while returning home after attending the Interna*tional Conference* on High-Energy accelerators held at Stanford University. Here Ed Knapp, MP-DO, (left) briefs 3 visitors.

Counters You Can Count On

by

Barb Mulkin



Seventy-millimeter-thick sample composed of discarded paper, cheesecloth and other contaminated materials from plutonium processing area is placed in counting chamber in preparation for measurement of radiation levels by "pancake" counter.

John Umbarger works in LASL's nuclear safeguards group, A-1, but they count on him in CMB-11. They count on him and his counter, that is.

Umbarger has developed a monitoring system capable of detecting low levels of transuranic radiation in solid waste. Over in CMB-11, DP West Site, a research project is underway that requires an accurate way of detecting and counting such radiation. The counter came just in time to aid the project. It is also making it possible for LASL to comply with new criteria concerning solid waste disposal established by the Atomic Energy Commission's Division of Waste Management and Transportation.

Umbarger feels the system, a first in the industry, is valuable now, but may have its real impact in the future.

The burgeoning use of nuclear materials has created a need for a whole new technology in the field of contaminated waste disposal. This increasing use, in fields such as fuel fabrication and the concomitant reprocessing of spent fuels, has made it mandatory that a reliable way of waste disposal be found, Umbarger noted.

All material used in plutonium processing areas is regarded as contaminated, and disposal has normally been by burial. However, the AEC now calls for segregation of such residues, with all materials contaminated at or above the radiation level of 10 nanocuries per gram (10 nCi/g) to be packaged separately and sent to 20-year retrievable storage. Ten nanocuries of such contamination is the approximate peak level of naturally occurring radium-226 found in the earth's crust.

The 10 nanocuries level is equivalent to 1.6×10^{-7} grams of plutonium-239 per gram of waste or 0.16 parts per million by weight.

Last fall, a CMB-11 team began the task of identifying or characterizing contaminated residues generated in plutonium processing areas. The objective of the team's research project is to help develop criteria for improving methods of sorting, packaging, and storing such waste.

Determining when a radiation level of 10 nCi/g was present in discarded material being sorted presented a problem. Umbarger said that until now there had been no way of accurately measuring such low levels of contamination.

"Existing methods, using a neutron counter and gamma scan techniques, were simply not sensitive enough," he explained. "They measured levels of toxic, heavy elements only to about 1,000 nanocuries per gram, and the new requirements called for readings of 10 nanocuries."

Umbarger had developed a prototype gamma- and x-ray monitoring system capable of 10 nCi/g detectability. Installed in a glove box assembly line in CMB-11, it was nicknamed a "pancake-geometry" counter for the flat, pancake shapes of the material samples that it scanned for radiation from a vantage point above the box.

The actual detector is a sodium iodide (NaI) crystal purchased from a commercial vendor of the FIDLER (field instrument for the detection of low energy radiation) design developed at Lawrence Livermore Laboratory.

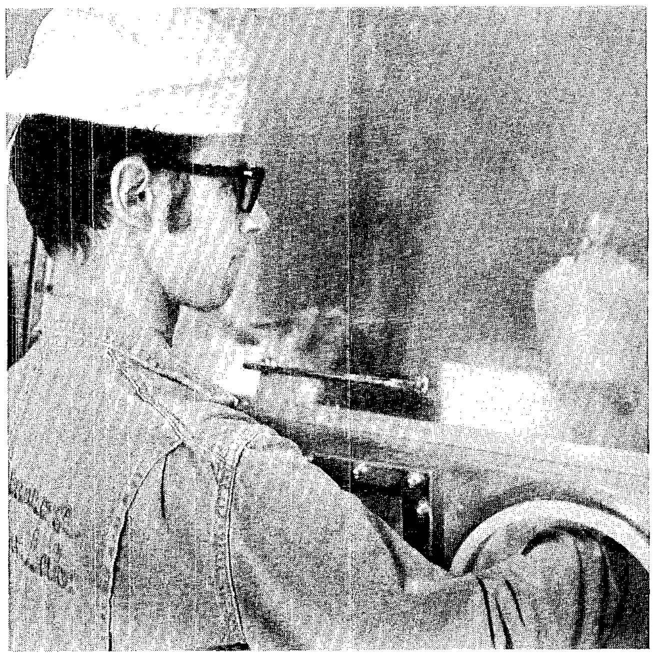
Umbarger said the crystal is cemented to the front face of a photomutiplier tube. The crystal is a scintillator and gives off light when penetrated by x rays and gamma rays from radioisotopes, he said.

"The gamma-ray photon from the transuranic elements knocks out an electron from the atomic K shell of an iodine atom in the crystal. This is called the photoelectric effect. The photon's energy is transferred to the electron, and the electron, which stops more easily in matter than a gamma ray, creates light in the crystal as it penetrates it and is stopped."

This light, Umbarger continued, is collected by the photomutiplier tube and converted into an electrical pulse that is recorded as a voltage measurement. The higher the energy of the gamma or x rays, the larger the electrical pulse.

Scanning through a 0.25-millimeter beryllium window, the detector assays contamination levels of various radioactive isotopes present in discarded booties, cheesecloth, gloves, plastic, and paper

CMB-11 personnel Jerry Dunn (left) and Phil Wanek prepare waste samples for scanning by the FIDLER "pancake" counter in glove box assembly line at DP-West Site. Dunn adjusts a ground strap on the detector assembly as Wanek places samples in the glove box.



used in plutonium processing areas.

With the data obtained from the system, the CMB-11 team calculates the results of the assay and determines which waste should be sent to burial and which to 20-year retrievable storage.

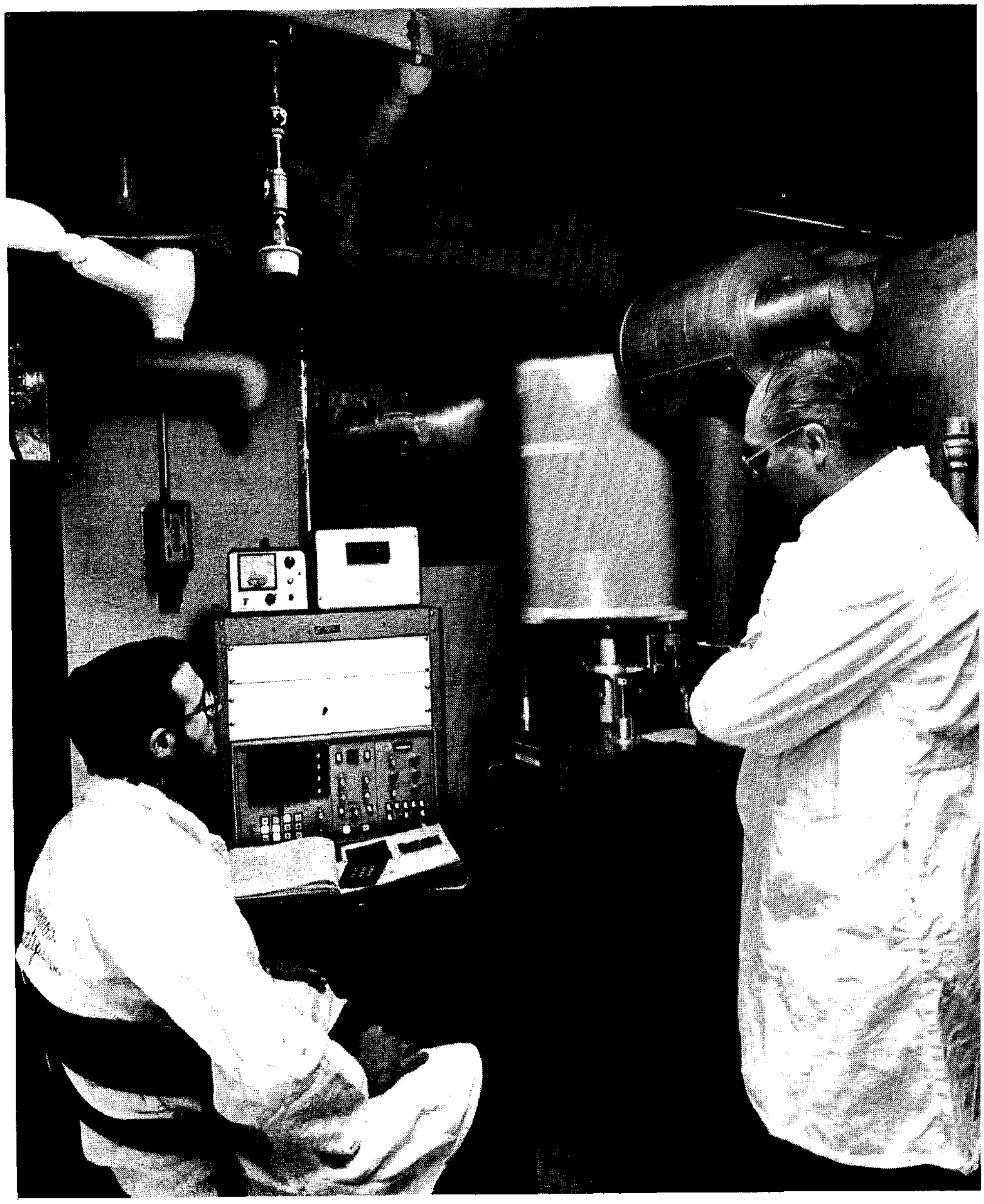
In operation since last fall, the pancake counter has proved reliable, but it has limitations. It can detect and count only low-energy radiation up to 100 keV. It records contamination levels in only two major energy regions, 16 keV (mostly x rays from the atomic L shell of plutonium and americium) and 60 keV (gamma rays from americium-241).

Umbarger explained that the detector's crystal is only 3 mm thick and does not have a large enough detector volume for the necessary interaction between gamma rays in the higher energy regions. If the package of waste being sampled is more than 70 mm thick, only a small portion of the radiation being emitted by the sample can penetrate the waste and reach the crystal for recording, hence low assay value results.

The system's limitations led Umbarger to design a Multienergy Gamma Assay System (MEGAS). Mechanical design and engineering on both systems was done by Leo Cowder, A-1.

MEGAS has a thicker NaI crystal—50 mm thick and 127 mm in diameter, which allows measurement of higher energy gamma rays that are capable of escaping the sample. Consequently, the new monitor permits accurate radiation readings on contaminated packages that are larger and denser, such as those containing cheesecloth or metal objects.

MEGAS is mounted behind a turntable on which a .06 cubic meter (2 cubic foot) box of waste is placed. The turntable also has a device that determines the weight of the box, giving a direct digital readout. In addition, it rotates slowly with a vertical movement that permits the crystal to scan all sides of the object, gaining an even response from gamma and x rays emanating from various locations throughout the box.



John Umbarger (left) and Leo Cowder, both of A-1, prepare MEGAS counter for shakedown calibration tests in special room at DP-West Site. Waste sample box in right background slowly turns as the detector scans contents for presence of radiation.

Radiation levels per gram are now computed manually but will soon be calculated automatically when a minicomputer interface, presently being designed by A-1's David Jones and Ray Martin, is finished and installed.

MEGAS was installed in CMB-11 this spring as the routine monitoring system for room-generated waste. The pancake counter will be kept in use for continued specialized waste studies in the lower energy regions.

By reporting accurately what contaminated waste may be buried safely and what should be placed in retrievable storage, MEGAS should prove a vital link in an effective waste management program.

short subjects

Honors: **Harold Agnew**, Director, was confirmed by the U.S. Senate during June as chairman of the 15-member general advisory committee of the U.S. Arms Control and Disarmament Agency. Agnew had been nominated to the post earlier by **President Nixon** to succeed **John J. McCloy**.

LASL photographers won awards in all 6 categories at the Industrial Photographers of the Southwest show held in Santa Fe in June. Winners of 1st, 2nd, and 3rd place awards were **Eugene Lamkin**, L-2, **Julie Grilly**, H-DO, **Leroy Sanchez**, CMB-11, and ISD-7 photographers **Henry Ortega, Winfred Headdy, Ivan Worthington, Robert Martin**, and **Bill Jack Rodgers** (winner of the Best of Show award).

Horace Noyes, SP-DO, was awarded the Senator Hollister Award for his contributions to boating safety as captain, Division Two (New Mexico and El Paso, Tex.), U.S. Coast Guard Auxiliary at the annual meeting of the Western States Boating Administrators Conference in Santa Fe in May.

W. Doyle Evans, P-4, has been selected from among 162 scientists to be one of 39 scientists to participate in the NASA Orbiter mission, which is expected to go into orbit about Venus. Evans' experiment, to be aboard the first of 2 spacecraft, will be to detect transient gamma ray sources.

Mathematics in the news: The First Los Alamos Workshop on Mathematics in the Natural Sciences was held June 12-18 in the P-Division Auditorium. Speakers included some 17 authorities from American universities, research institutions, and LASL. More than 200 attended the programs.

And at the request of the Los Alamos High School, **Fred Dorr**, C-DO, organized an Analysis Seminar for high school students. **Tom Klingner**, C-2, **Jo Ann Howell**, C-10, **David Kahaner**, C-3, **Gary Tietjen**, C-5, **Gloria Dimoplon**, CNC-4, **Mikkel Johnson**, MP-DO, and **Bob Malone**, T-6, addressed various classes from February through May.

From the AEC: The retirement of two well-known officials was announced: **Edwin E. Wingfield**, chief, Operations Branch of the AEC's Los Alamos Area Office, after almost 32 years of government service, and **David B. Anthony**, assistant manager for Plans and Budgets at the AEC's Albuquerque Operations Office, after 33 years of government service.

Almost $9 million in construction contracts was announced: $4,676,300 to Davis & Associates for a laser fusion laboratory: $3,340,000 to BOECON Corporation for the plutonium building at TA-55; $683,060 to Overhead Electric Company for upgrading electric utility systems at the CMR Building; $248,587 to Western States Construction Company for an addition to the health research laboratory at TA-43; and $31,803 to Marco Construction Company for a users trailer park for LAMPF at TA-53.

An $11 million national computer center for AEC laboratories engaged in controlled thermonuclear research is expected to be operative at Lawrence Livermore Laboratory in 1975. LASL will be linked to the center, sharing data with others engaged in CTR.

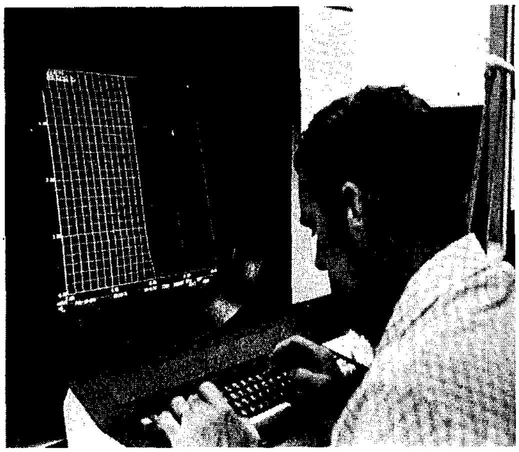
Signs of the times: The Pajarito School has been leased to house 50 Engineering Department personnel. A shuttle service at 45-minute intervals connects the school to the Administration building with stops at the Occupational Health Laboratory.

Scheduled for installation this summer are 11 transportable offices accomodating more than 100 people. These will be located at sites convenient to L-Division, the CMR building, the CTR building, and, for the Engineering Department, at the construction site for the new plutonium facility.

Retirements: **Byron M. Carmichael**, T-1, staff member; **William S. Cunningham**, SD-5, lab machinist; **Kenneth E. Wilde**, ENG-1, construction inspector; **Frank J. Brush, Jr.**, CNC-11, spectrometer operator.

Richard M. Ford, M-1, an electronics engineer, was accidentally electrocuted while troubleshooting an electron accelerator at GT Site. Ford had been employed at LASL since 1962 and is survived by his wife, **Barbara**, and 3 children, **Matthew, Alexandra**, and **Richard**.

Lynn Maas, C-4, and Dick Young, TD-4, study a problem in high explosive (HE) pipe closure. The display is of point plots. The axis of the pipe is at left and the HE is at bottom right.



Young changes to an enlarged mesh display, with point plots interconnected for easier visualization, and returns to the beginning of the sequence to study the problem in the context of time.

At 3 microseconds, the HE has produced a noticeable bulge at lower right. Mesh lines beginning to distort at left represent effects of the HE upon the pipe. So far, the explosion is proceeding smoothly.

INTERACTIVE COMPUTING

"It puts us back to a point where we are in control," says Martin Torrey, TD-4, with satisfaction. "It's the kind of advance that is having some fundamental impact on work habits and attitudes and I think it's going to have a great deal more," he adds.

Torrey was discussing graphic interactive computing, an advanced technology now operative at the Central Computing Facility and one that seems destined to initiate profound changes in the future. He is a frequent interactive computer user who participated in its early development at the Los Alamos Scientific Laboratory.

Lynn Maas, who, with Mike Blood (both C-4), played a key role in setting up graphic interactive computing as it exists today at LASL, comments, "Paradoxically, in creating machines that were supposed to be servants to man, man had to become somewhat subservient to those machines."

Blood explained that in customary computer usage, the user brings his punched cards to CCF. Data taken from them is fed into the computer—and the user goes out of the picture. He must wait ineffectually until the machine gives him his printout, and he is limited to post-run analysis. Pinpointing a problem can be like looking for a needle in a haystack.

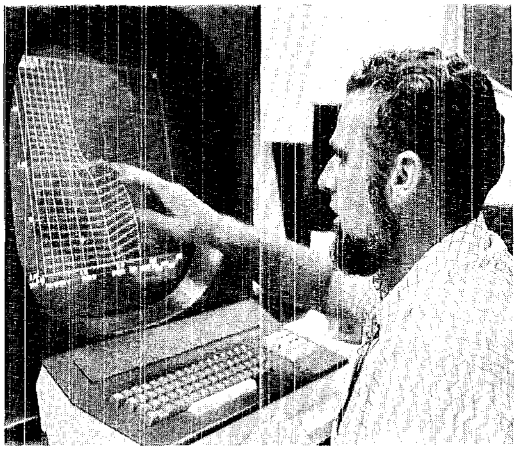
If a revision is indicated, the user must then rewrite his program and enter it again into the computer, hoping that this time it will be right.

Not only that, computers are stupid, implacable, and unforgiving. Computers don't "like" discrepancies, so if coordinates in a series of time steps go enough awry, the machine will abruptly shut itself off.

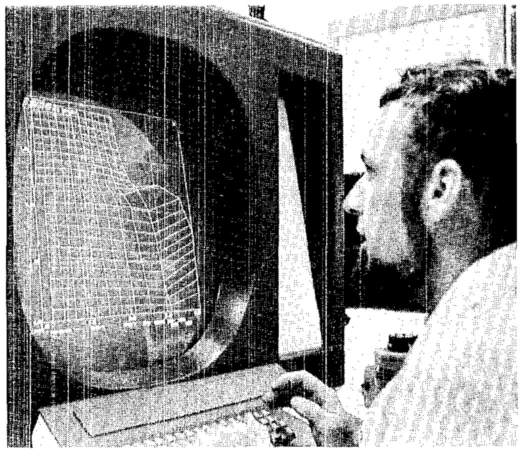
This will happen even if the data in question is inconsequential to the problem. The computer doesn't know better, but even if it did, it couldn't care less.

Thus, the user's ability to modify while computation is in progress is a unique benefit of interactive computing, according to Dick Young, TD-4, another enthusiastic user who also contributed to early interactive computing development at LASL. "As a simulated explosion progresses in time steps, I can see problems developing in an area that is irrelevant, such as in the formation of a plume. I can literally alter the computational physics in that area. This prevents my run from aborting and allows me to continue investigating my areas of real concern," he explains.

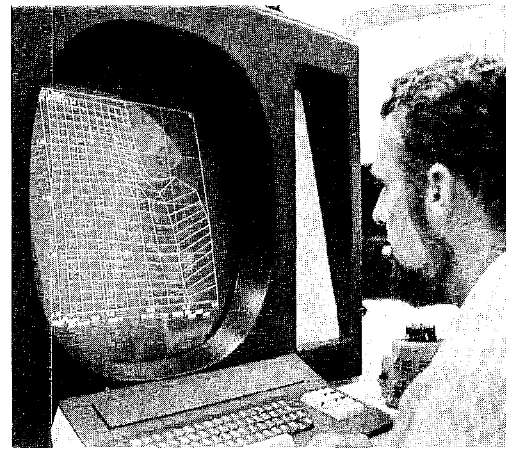
More important, Young can alter design features at any point in time (typically in 0.25 microsecond intervals), then move forward or backward in time to see the effects his change has wrought. The computer automatically adjusts both the program and the graphic displays accordingly.



At 7 microseconds, Young spots a problem developing as lines representing expanding gas begins to turn the corner around an aluminum lip. The mesh tangle developing could disrupt further computation.



At 12 microseconds, Young moves +-shaped cursor to the problem coordinate, telling the computer he will move the point. Moving it will not affect area of interest to the left.



Young has now moved the cursor and instructed the computer to move the mesh lines down to the new coordinate. Note how the lines in question now form a "V". Subsequent displays then proceeded smoothly.

men and machines talk to each other in new creative problem-solving technique

Management looks with favor upon interactive computing for its cost effectiveness in a number of computations, such as the study of explosion phenomena and for stress analysis. Not only is computer time per program substantially reduced, but, equally important, so is the time of the users. "The type of problems I deal with used to require days. Now I can solve one in an hour," Young says.

Upon being urged to do some crystal-balling, Maas speculated that if interactive computing were to become widespread, it would reduce costs initially because many programs could be run in considerably less time. However, Maas also felt that as users began to take advantage of the time savings of graphic interactive computing, more programs would be coming in and overall volume would increase beyond present levels. Nonetheless, this would be cost effective inasmuch as more programs could be handled with much the same equipment and personnel as at present.

Indications are strong that graphic interactive computing will indeed grow. Hardware costs have been declining radically—historically a harbinger of proliferation in all technologies. As an example, the CCF's present Sanders graphic unit, linked to the CCF's two 7600 computers, cost $180,000 several years ago. Today, costs for new, albeit less sophisticated, graphic interactive remote terminals range around $5,000.

That C-Division considers graphic interactive computing an idea whose time is here is evidenced by a new 9-man computer graphics section just formed within group C-4.

But the most meaningful benefit of all defies measurement by conventional yardsticks: creativity. Interactive computing may be likened to a potter turning a vessel of clay: he can shape and change his design to his desire. Graphic interactive computing calls for intense concentration and is highly compatible with the human psyche in a very direct and sensory way. This stimulates imagination which may evoke from that most marvelous and mysterious computer of all, human intuition, answers that could never be derived from reams of computer printouts.

This psychological coin has two sides, however. Some users may be reluctant to abandon the old and familiar and accept the new and the strange. Graphic interactive computing requires new techniques and attitudes.

Nonetheless, once acclimated to graphic interactive computing, users are likely to become enthusiasts. As Maas puts it, "It re-introduces art into computing."

And as Torrey said at the beginning, "It puts us back to a point where we are in control." No wonder he said this with satisfaction.

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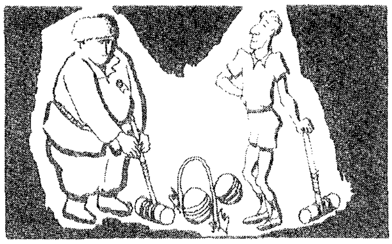


years ago in los alamos

Culled from the July and August, 1964 files of
The Atom and the Los Alamos Monitor by Robert Y. Porton

New Division Leader

Harold Agnew, who returned from France last month after nearly 3 years on leave of absence, has been named LASL Weapons Physics Division leader. He replaces Max Roy who will continue as assistant director for production. Agnew served as scientific advisor to the Supreme Allied Commander, Europe.

Contract Awarded

A $338,000 contract has been awarded by the Atomic Energy Commission for preliminary design of the proposed Los Alamos Meson Physics Facility. The firm, Giffels and Rossetti of Detroit, Michigan, has been commissioned to produce an architectural design for development of a cost estimate the AEC can use in a budget proposal. The facility is to be an 800 million electron volt linear proton accelerator.

Croquet International

The pursuit of controlled thermonuclear reactions is an international activity. Scientists engaged in it frequently gather to exchange data and ideas. One of these reciprocal meetings was held in Los Alamos in early July. Participants were Project Sherwood researchers from LASL and 7 Russian scientists. When the shop talk was concluded, the party enjoyed a picnic at Jim Tuck's home. Tuck, who heads the Sherwood program at LASL, has a spacious back yard. There was room and time enough for an exciting round of another international activity—croquet!

Change at ALO

Kenner Hertford, Manager of the AEC's Albuquerque Operations Office since 1955, is retiring this month. He will be succeeded by Lawrence Gise, who has been deputy manager since 1961. Hertford was chief of research and development for the office of the Chief of Staff of the Army when he retired to head ALO.

Steam Wells Hit

James P. Dunigan and Associates have hit 500-degree steam in 2 wells on the 100,000-acre Baca Location No. 1, west of Los Alamos. Dunigan's group hopes to use the steam to drive turbines to generate electricity. Dunigan would not reveal the pressures found in the wells, but said geothermal power is being generated in California with 50-psi steam.

Left-handed?

If you're a scientist or mathematician, you are more likely to be left-handed than if you are engaged in administrative or secretarial work, according to Sandra Engelke, P-4.

Her conclusion is the result of a project she completed while taking a course titled "Elementary Statistics," conducted by Roger Moore, C-5, as part of C-Division's continuing education program.

Engelke polled representative LASL groups, obtaining 113 replies to her questionnaire categorizing respondents as (1) administrative-secretarial, (2) mathematical-scientific, and (3) other.

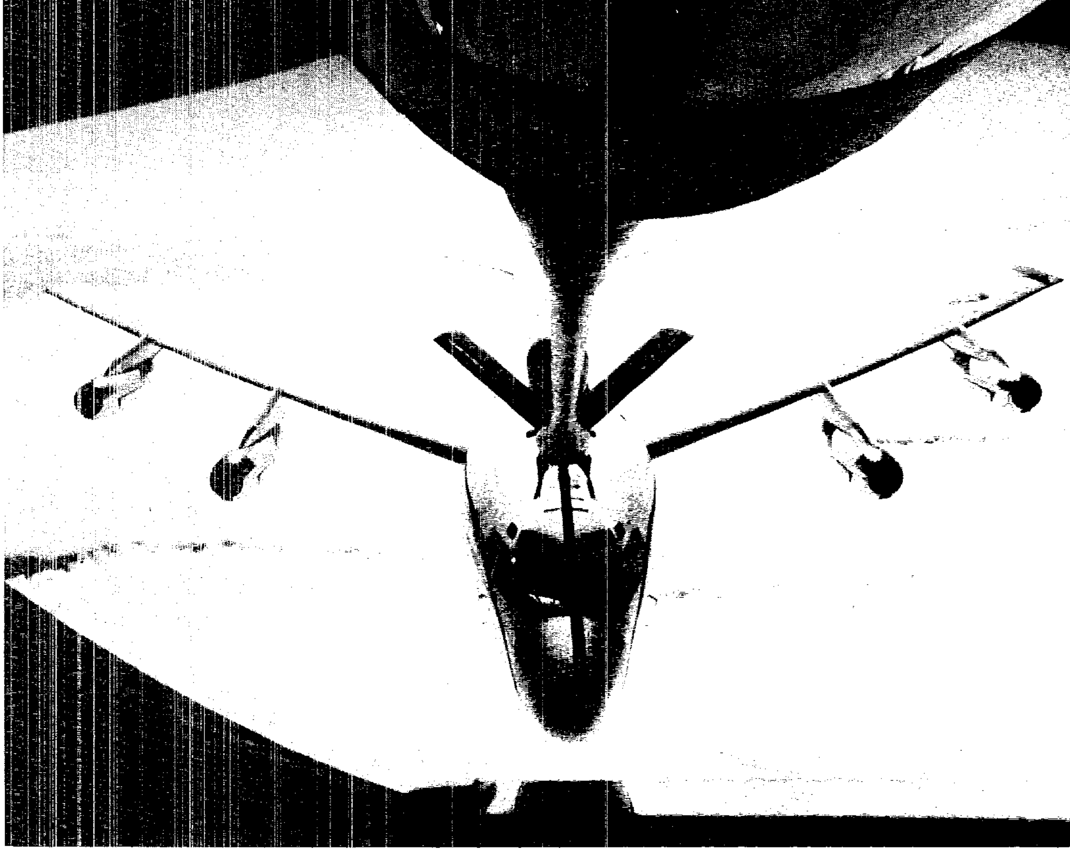
Darkroom trickery helps Sandra Engelke illustrate administrative tendency to right-handedness, scientific to left-handedness.

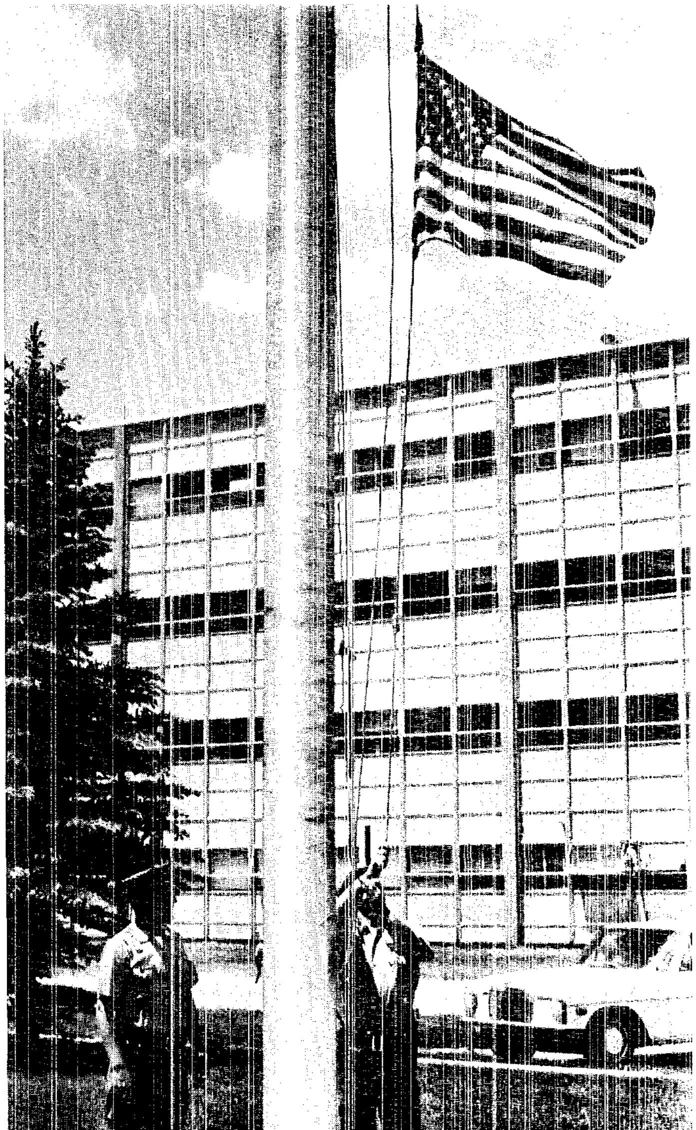
Among 54 LASL scientists and mathematicians, the percentage reporting left-handedness was 13 per cent whereas 4.5 per cent of the population as a whole exhibit left-handedness, according to the Encyclopedia Britannica.

Applying 2 types of analyses—the chi-square test and hypothesis testing—Engelke determined that the probability of the findings being due to chance alone was less than 1 per cent.

Since her project was strictly statistical, Engelke leaves speculations as to reasons and implications to others. But if you have a left-handed child showing an interest and aptitude for science and mathematics, don't be surprised.

During June, a USAF KC-135 tanker refuels the NC-135 based at Kirtland Air Force Base, Albuquerque, that is frequently used by LASL personnel to conduct atmospheric and solar measurements. This refueling took place over the Pacific during an instrumentation calibration flight, but refueling is occassionally required for other flights, such as one proposed from Capetown, South Africa, to the Antarctic region later this year. Bill Jack Rodgers, ISD-1, was there to take this picture.





"My name is Tim Swan and I am a sixth grade student at Palisades Elementary School in Lake Oswego, Oregon. We are having a project in which we are to send an American flag to a famous person or place.

"I'm sending my letter to you because without you and your fellow scientists, we would never have had the atom bomb with which to stop the war.

"The reason for the flag project is to give us a better understanding of the American flag.

"For those reasons I am sending a letter to you asking you to fly my flag for one day. Would you also sign your name on the white band opposite my name?"

Thank you,
Tim Swan

(LASL flew Tim's flag on June 4 and sent him and his classmates photos of the occasion.)

In a display of patriotism closer to home, Los Alamos celebrated Independence Day in the traditional but always dramatic way shown on the back cover.

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